

## (Part-I)

**Q.2. Write short answers to any Five (5) questions: 10**

(i) Define nuclear chemistry.

**Ans** Nuclear chemistry is the branch of Chemistry that deals with the radioactivity, nuclear processes and properties. The main concern of this branch is with the energy of atom and its uses in daily life.

(ii) Differentiate between physical properties and chemical properties.

**Ans**

### Physical Properties

The properties that are associated with the physical state of a matter are called physical properties; like colour, smell, taste, etc.

### Chemical Properties

The chemical properties depend upon the composition of substance. When a substance undergoes a chemical change, its composition changes and a new substance is formed.

(iii) Define symbols of elements.

**Ans** The elements are represented by symbols, which are abbreviations for the name of elements. A symbol is taken from the name of that element in English, Latin, Greek or German. If it is one-letter, it will be capital as H for Hydrogen. In case of two letters symbol, only first letter is capital e.g., Ca for Calcium.

(iv) Explain the treatment of cancer by radiotherapy.

**Ans** **Radiotherapy (Treatment of Cancer):**

For the treatment of skin cancer, isotopes like P-32 and Sr-90 are used because they emit less penetrating beta radiations. For cancer, Co-60, affecting within the



body, is used because it emits strongly penetrating gamma rays.

(v) Explain the use of U-235 in power generation.

**Ans** U-235 is used to generate electricity by carrying out controlled nuclear fission reactions in nuclear reactors.

(vi) Define atomic radius and give example.

**Ans** The half of the distance between the nuclei of the two bonded atoms is referred as the atomic radius of the atom. For example, the distance between the nuclei of two carbon atoms in its elemental form is 154 pm, it means that its half 77 pm is the radius of carbon atom.

(vii) Why ionization energy increases from left to right in a period?

**Ans** It is because the size of atoms reduces and valence electrons are held strongly by the electrostatic force of nucleus. So, more energy is required to remove valence electrons.

(viii) Write down the name of elements found in second period.

**Ans** Second period consists of 8 elements and their names are:

- |             |              |           |
|-------------|--------------|-----------|
| 1. Lithium  | 2. Beryllium | 3. Boron  |
| 4. Carbon   | 5. Nitrogen  | 6. Oxygen |
| 7. Fluorine | 8. Neon      |           |

### Q.3. Write short answers to any FIVE (5) questions: 10

(i) Why do atoms react?

**Ans** Every atom has a natural tendency to have 2 or 8 electrons in its valence shell so that they can be stable. Atoms react with each other to fulfill this quantity of electrons.

(ii) Why does ice float on water?

**Ans** Floating of ice on water is because of hydrogen bonding. The density of ice at  $0^{\circ}\text{C}$  ( $0.917 \text{ g/cm}^3$ ) is less than that of liquid water at  $0^{\circ}\text{C}$  ( $1.00 \text{ g/cm}^3$ ). In the liquid state, water molecules move randomly. However, water



freezes, the molecules arrange themselves in an ordered form, that gives them open structure. This process expands the molecules that results in ice being less dense as compared to water.

(iii) **Ionic compounds are solids. Justify.**

**Ans** Ionic compounds are made up of positively and negatively charged ions. Thus, they consist of ions and not the molecules. These positively and negatively charged ions are held together in a solid or crystal form with strong electrostatic forces. So, ionic compounds are solid in nature.

(iv) **In which form sulphur exists at 100°C?**

**Ans** At 100°C, sulphur exists in the monoclinic form.

(v) **What is diffusion in gases? Give an example.**

**Ans** Gases can diffuse rapidly. Diffusion is defined as spontaneous mixing up of molecules by random motion and collisions to form a homogenous mixture. Rate of diffusion depends upon the molecular mass of the gases. Lighter gases diffuse rapidly than heavier ones. For example,  $H_2$  diffuses four times faster than  $O_2$  gas.

(vi) **Why do we stir paints thoroughly before using?**

**Ans** We stir paints thoroughly before using because paint is a suspension and suspension is a heterogeneous mixture of undissolved particles in a given medium. Particles are big enough to be seen with naked eye. Whenever, we use paint, we stir it thoroughly because the settled down particles will be suspended again in mixture and will be easy to use.

(vii) **What do you mean by % Volume / Volume?**

**Ans** It is the volume in  $cm^3$  of a solute dissolved per 100  $cm^3$  of the solution.

$$\% \text{ by Volume} = \frac{\text{Volume of solute (cm}^3\text{)}}{\text{Volume of solution (cm}^3\text{)}} \times 100$$



(viii) How will you test whether given solution is a colloidal solution or not?

**Ans** We shall pass light in the solution. If the given solution scattered the light then it is a colloidal solution. But if it does not scatter light then it is not a colloidal solution.

**Q.4. Write short answers to any FIVE (5) questions: 10**

(i) What are redox reactions?

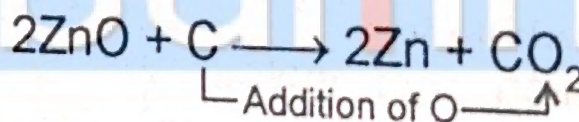
**Ans** Chemical reactions, in which the oxidation state of one or more substances changes are called oxidation reduction or redox reactions.

(ii) What is meant by a reducing agent?

**Ans** Reducing agent is the species that reduces substance by donating electrons to it. The substance (atom or ion) which is oxidized by losing electrons is also called a reducing agent. Almost all metals are good reducing agents because they have the tendency to lose electrons.

(iii) Define oxidation in terms of oxygen. Give an example.

**Ans** Oxidation is defined as the addition of the oxygen. The example is given below:



(iv) Calculate the oxidation number of "N" in  $\text{AgNO}_3$  and  $\text{HNO}_3$ .

**Ans**  $\text{AgNO}_3$ :

$$\text{O.N. of Ag} + \text{O.N. of N} + 3[\text{O.N. of O}] = 0$$

$$+1 + \text{N} + 3(-2) = 0$$

$$+1 + \text{N} - 6 = 0$$

$$\text{N} - 5 = 0$$

$$\boxed{\text{N} = +5}$$

$\text{HNO}_2$ :

$$[\text{O.N. of H}] + [\text{O.N. of N}] + 2[\text{O.N. of O}] = 0$$

Putting the values in above formula



$$(+1) + N + 2(-2) = 0$$

$$1 + N - 4 = 0$$

or

$$N - 3 = 0$$

$$\boxed{N = 3}$$

(v) Write two applications of gold.

**Ans** Following are two applications of gold:

1. Because of its inertness in atmosphere, it is an ornamental metal as well as used in making coins.
2. Gold is too soft to be used as such. It is always alloyed with copper, silver or other metal.

(vi) Give occurrence of alkali metals and alkaline earth metals.

**Ans** **Alkali Metals:**

They are very reactive and always occur in combined form.

**Alkaline Earth Metals:**

They are fairly reactive and also occur in combined form.

(vii) Write any two chemical properties of non-metals.

**Ans** Following are the two chemical properties of non-metals:

1. They usually do not react with water.
2. Their valence shells are deficient of electrons, therefore, they readily accept the electrons to complete their valence shells and become stable.

(viii) What is trend of electropositive character of metals in groups and periods?

**Ans** **Trend in Group:**

Electropositive character increases down the group because the size of atoms increases.

**Trend in Period:**

Electropositive character decreases across the period from left to right in periodic table because the size of atoms decreases due to increase of nuclear charge.



**NOTE:** Attempt any TWO (2) questions.

**Q.5.(a) Write five properties of cathode rays.** (5)

**Ans** Properties of cathode rays:

- The important properties of cathode rays are as following
- These rays travel in a straight line perpendicular to the cathode surface.
  - They raise the temperature of the body on which they fall.
  - They can cast a sharp shadow of an opaque object placed in their path.
  - Light is produced when these rays strike the walls of the discharge tube.
  - J.J. Thomson discovered their charge / mass ( $e/m$ ) ratio.

**(b) Write four differences between molecule and molecular ion.** (4)

**Ans** Differences Between Molecule & Molecular Ion

	Molecule	Molecular Ion
1.	It is the smallest particle of an element or compound which can exist independently and shows all the properties of that compound.	It is formed by gain or loss of electrons by a molecule.
2.	It is always neutral.	It can have negative or positive charge.
3.	It is formed by the combination of atoms.	It is formed by the ionization of a molecule.
4.	It is a stable unit.	It is a reactive specie.

**Q.6.(a) Write the properties of covalent compounds.** (5)

**Ans** General properties shown by covalent compounds are as follows:



1. They have usually low melting and boiling points.
2. They are usually bad conductors of electricity. The compounds having polar character in their bonding are conductors of electricity when they dissolve in polar solvents.
3. They are usually insoluble in water but are soluble in non-aqueous solvents like benzene, ether, alcohol and acetone.
4. Large molecules with three dimensional bonding form covalent crystals which are very stable and hard. They have very high melting and boiling points.

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**(b) What is allotropy? What are its reasons? Explain transition temperature also. (4)**

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**Ans** Allotropy:

The existence of an element in more than one forms in same physical state is called allotropy.

Allotropy is due to:

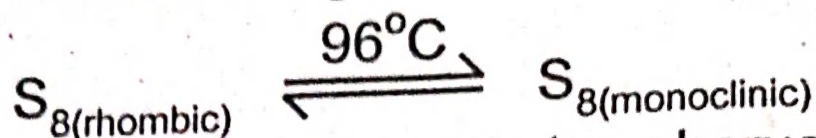
- (i) The existence of two or more kinds of molecules of an element each having different number of atoms such as allotropes of oxygen are oxygen ( $O_2$ ) and ozone ( $O_3$ ).
- (ii) Different arrangement of two or more atoms or molecules in a crystal of the element. Such as, sulphur shows allotropy due to different arrangement of molecules ( $S_8$ ) in the crystals.

They always show different physical properties but may have same or different chemical properties.

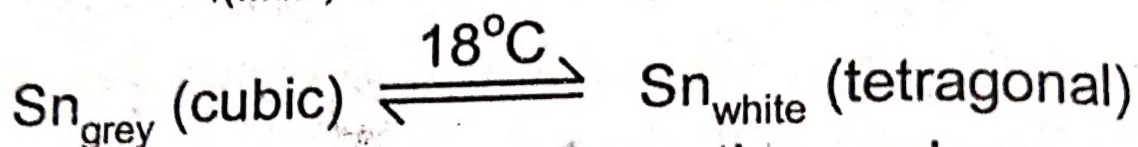
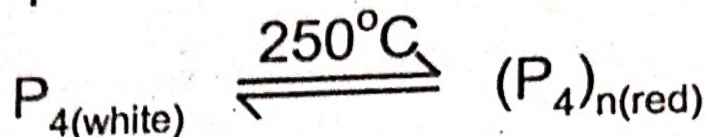
Allotropes of solids have different arrangement of atoms in space at a given temperature. The arrangement of atoms also change with the change of temperature and new allotropic form is produced. The temperature at which one allotrope changes into another is called transition temperature. For example, transition temperature of sulphur is  $96^\circ\text{C}$ . Below this temperature, rhombic form is



stable. If rhombic form is heated up to  $96^{\circ}\text{C}$ , its molecules re-arrange themselves to give monoclinic form.



Other examples are tin and phosphorus.



White phosphorus is very reactive, poisonous and waxy soft solid. It exists as tetra-atomic molecules. While red phosphorus is less reactive, non-poisonous and brittle powder.

**Q.7.(a) Discuss electrolysis of water.** (5)

**Ans** For Answer see Paper 2016 (Group-I), Q.7.(b).

**(b) Give the four characteristics of colloid.** (4)

**Ans** Following are the four properties of colloids:

- (i) The particles of colloids are large and consist of many atoms, ions or molecules.
- (ii) A colloid appears to be homogeneous but actually it is heterogeneous. Hence, they are not true solution. Particles do not settle down for a long time therefore, colloids are quite stable.
- (iii) The particles of the colloids scatter the light rays thus emitting the beam of light.
- (iv) The particles of colloids can pass through the filter paper.